L I G N O V I S I O N E N

Schriftenreihe des Institutes für Holzforschung (ihf)
am Department für Materialswissenschaften und Prozesstechnik (MAP)
an der Universität für Bodenkultur Wien

Band 9

Book series of the Institute of Wood Science and Technology (ihf)
at the Department of Material Sciences and Process Engineering (DMSP)
at the University of Natural Resources and Applied Life Sciences, Vienna

Issue 9

Proceedings of the
COST Action E44 Conference

Broad Spectrum Utilisation of Wood

Edited by
Alfred Teischinger and Joris Van Acker

in Co-operation:
COST - European Co-operation in the field of
Scientific and Technical Research
Action E44 - Wood Processing Strategy

Primary Wood Conversion Processes
Tree Quality leads to processing trees using saw milling for timber, chipping into particles and peeling or slicing trees into veneer. Decision on selecting one of these options in respect of further processing is both related to the forest resource itself and the end products envisaged. Quality of raw materials is defining the possibilities and profitability for further processing.

Integrated Processing of Forest Products
Integrated processing of forest products can use different strategies to combine primary wood conversion processing. These combinations are based on sorting and grading of logs and sawn timber but also as innovative options for secondary processing of a primary processing product.

Mixed Stand and Mixed Species Processing
New forest strategy approaches will lead to more mixed stands in the future. New options for the utilisation of mixed stand and even mixed species processing will become essential.

Processing in Relation to Tree Dimensions and Partitioning of Trees
Processing of small diameter logs into sawn timber components is an important topic for future economics of whole stem processing. This will also have to deal with problems induced by the presence of juvenile wood, spiral grain, reaction wood, ... Large dimension trees will deed new options for processing or as part of it and even the total tree use strategic factors in the broad spectrum utilisation of wood.

COST-aided
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Abstracts - Session 1: Tree quality and processing

Scanning Techniques as Tools for Integration in the Wood Conversion Chain–Some Industrial Applications

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Keywords: Wood, Scanning, X-ray, heart-wood, spiral-grain, wood quality

ABSTRACT

The market makes lot of different demands on sawn wood products. There are requirements regarding strength, straightness, durability, aesthetic appearance, etc. Most of these demands can be fulfilled by the inherent properties of the trees in the forest. The challenge is to utilize the wood properties to fulfil the market demands in an efficient way.

The raw material has to be selected so every customer gets the right piece of wood with the required properties. In order to achieve this, the raw material has to be characterized with different scanning techniques in several steps before and during the breakdown process. In this presentation some examples and experiences from industrially implemented scanning techniques will be described.

We can today, after some years of R&D efforts, see how X-ray LogScanners are implemented in the industry. So far they are used for measurement of diameter under bark, internal knot structure, annual ring width, heartwood content and commodity grades. The full potential of this technique is, however, not being fully utilized yet.

Equipment for measurement of spiral grain on logs and sawn wood has also been implemented industrially. It has been proven that with the aid of this equipment boards that will twist during drying can be sorted out and treated separately, thus enabling production of straighter timber.

The third type of equipment that will be presented is a heartwood scanner. With this scanner, sawmills select Scots pine planks with high heartwood content that are suitable for applications where improved durability is required.

These examples show that scanning technology is a key factor for a successful integration between market and forest.

WQI - a New Zealandish lean, mean and hungry wood quality initiative compared to Swedish initiatives

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Keywords: Learning organisation, Wood quality, Intellectual property, IP revenue, High performance wood, Triple Helix

ABSTRACT

This paper describes a consortia initiative in New Zealand established to focus on wood quality as a way of enhancing the wood product value, create more valuable forest and get revenue from wood quality tools and IP. Four key research areas has been tailored according to the participants needs supporting solid wood application

- Resource characterisation
- Improved appearance properties and performance
- Improved structural properties and performance
- Improved stability and straightness of wood products

The idea of the three year program is to

- Enhance wood product value by segregation of the resource by quality parameters
- Produce a future high performance forest with big and straight trees
- Generate Intellectual properties, IP, that support the development of a high technology cluster based on wood quality tools.

The NZ, WQI Ltd cluster strategy is compared to similar ones made in the northern part of Sweden, SkeWood, and Träcentrum Norr, TCN. TCN is newly established by the Wood industry, Luleå University of Technology and SP/Trätek institute in terms of strategy, vision and organisation. Skewood is an ongoing academic wood research program with focus areas Wood building, Wood communication and Wood metrics. WQI Ltd and Skewood are analysed after half time in aspects of learning and knowledge building.

Modelling of the sawn timber yield of beech logs with regard to their dimension and red heartwood proportion

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Keywords: Beech, red heartwood, cutting methods, sawn timber yield simulation, proceeds calculation

ABSTRACT

Beech (*Fagus sylvatica* L.) is the most important broad-leafed species in Germany. The bright and workable high-quality beech wood is preferably demanded by the furniture industry. Nevertheless, red heartwood has still significance as one of the most important value-decreasing quality criteria of beech round and sawn timber. The sawmill industry strives for optimising the yield of sawn timber without red heartwood using special cutting-techniques.

The objective of this study was to describe the usual cutting techniques of beech logs for the production of high-quality sawn timber and to simulate the influence of red heartwood and log dimension on the yield of produced sawn timber using different sawing patterns. First of all a concept for a calculation model simulating three sawing patterns was developed. The results of a survey conducted in several specifically selected beech sawmills were preferably considered in this model. Important cutting methods for beech logs are *live log sawing, tangential cutting* and *double cut.* Tangential cutting is most often chosen in sawmill practice for a quality-oriented cut.

The model is based on the calculation of the absolute volumes of simulated boards by means of an integral calculation of the mid-cross-section of the saw log and by sorting the boards into three quality/price classes. The calculation results showed that live log sawing is less suitable for the production of high-quality sawn timber from beech logs with a large proportion of red heartwood. Using the tangential cutting-technique, the band saw can be flexibly adjusted to the beech log dimension and to the open laid internal defects like heartwood. Finally a calculation of the yield of sawn timber was carried out. An additional calculation of the proceeds and the marginal income describes the economic correlation between the amount of red heart at the top log diameter and the yield of produced sawn timber for each investigated cutting pattern. Advancing the knowledge on the influence of red heartwood on the yield and proceeds of sawn timber is of paramount importance for the processing strategy of a hardwood sawmill.

Alternative processing solutions for Red oak (*Quercus rubra*) from converted forests in Flanders, Belgium

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Keywords: Red oak, forest conversion, variable dimensions, processing

ABSTRACT

Northern Red oak (*Quercus rubra* L.) was first used as a forest species in Belgium towards the end of the 19th century, partly to produce construction wood for Campine coal mining industries. At present, it occupies around 5 to 6 % of the standing wood volume in Flanders. Because of its esthetic botanical qualities, it has been planted also quite abundantly in gardens, parks and along roads. Compared to Pedunculate and Sessile oak (resp. *Q. robur* L. and *Q. petraea* Liebl.), Red oak generally exhibits faster growth and, hence, is able to produce large dimension timber in relatively short time-spans. Commercial logs of 6 to 12 m length and over 70 cm diameter are not uncommon. Even though Red oak wood is generally considered to be less strong, less durable and more difficult to work than indigenous oak wood, its stemwood is well-suited for manufacturing furniture, flooring and (indoor) construction timber, while the smaller dimension thinning material and crown wood is valued as domestic firewood. However, being a non-endemic and rather invasive tree species, recent forest conversion plans that are largely ecologically motivated aim at eradicating it from Flemish forests. This way, more natural, mixed forests with European oak and Scots pine (*Pinus sylvestris* L.) are envisaged. In the near future, yet with an adequate processing strategy still lacking, Red oak wood will increasingly become available to the (local) wood-processing industry. An overview is given of relevant differences between Red oak and European oak with respect to tree morphology, wood anatomy, esthetics and end-use related physical wood properties. Alternative utilisation options are discussed. To conclude, an attempt is made to assess the short-term socio-economical impact of this forest conversion, at a regional scale.

Specific wood and timber properties and competitive ability of Nordic Scots pine in mechanical wood processing

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Keywords: *Pinus sylvestris*, saw milling, further processing, wood properties, markets, competition.

ABSTRACT

Nordic sawmill industry working with Scots pine (*Pinus sylvestris*) has to fit the activities and products into the current and future market segments and implement new marketing strategies to be able to compete in the international market, and re-gain, or rather increase, the market share compared to alternative wood species and substituting materials. This research project is a part of the Finnish-Swedish Wood Material Science and Engineering Research Programme (2003–2007). The principal aim is to increase the basic knowledge of Nordic Scots pine wood and timber regarding the potential for improved utilisation of specific wood and timber properties in joinery, interior, and furniture products (sub-project 1) and structural products (sub-project 2). Further, the aim is to utilise the results in, and link them to, marketing planning by developing new marketing strategies for pine products (sub-project 3). Parallelly, an expert group is working to map the current knowledge, set the priorities of the key marketing arguments, provide the researchers with the necessary knowledge, develop new ideas for products, processing and treatment, as well as to offer a channel for disseminating the results.
The scientific aims of the project are derived from industrial needs. The most crucial industrial objective is to improve the positioning of Nordic Scots pine in relation to the aforementioned wood product segments, primarily in the medium term but also in the short term. The industrial sub-objectives focus on defining:

- The critical, most valuable properties of Nordic Scots pine which should be further developed
- Key arguments to be used by the industry to target on the customers
- The most important competing species and substituting materials in the market; comparing Nordic Scots pine to them, and identifying especially those at the approximately similar or clearly lower level
- Key technologies where to embark on in technology development
- The tools, channels, and the most important target groups for industrial promotion
- A new marketing strategy for Nordic Scots pine

Sub-project 1 aims to study the properties of Scots pine wood related to visual impression (aesthetic properties), easiness for tooling and service (incl. feel for comfort), life expectancy and durability (wear, weather and decay resistance). Sub-project 2 aims to study the properties related to static and dynamic mechanical properties (in bending) as well as dimensional and form stability. In this paper, the contents and selected results are presented from these sub-projects.

Impressum / Imprint

Verleger / Publisher:	Universität für Bodenkultur Wien University of Natural Resources and Applied Life Sciences, Vienna
Herausgeber / Editor:	Alfred Teischinger
Redaktion / Editorial office:	Robert Stingl
	Institut für Holzforschung (ihf) am Department für Materialwissenschaften und Prozesstechnik (MAP) an der Universität für Bodenkultur Wien
	Institute of Wood Science and Technology (ihf) - Department of Material Sciences and Process Engineering (DMSP), University of Natural Resources and Applied Life Sciences, Vienna
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L I G N O V I S I O N E N Band 9 / Issue 9

Proceedings of the COST Action E44 Conference
Broad Spectrum Utilisation of Wood

June 14th - 15th 2005; BOKU Vienna, Austria

Edited by Alfred Teischinger and Joris Van Acker

ca. 210 Seiten (A4) / Pages (size A4)
Text and Summary: in englischer Sprache / in English language

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